Sub-Slab Depressurization System Construction Completion Report

Former General Instrument Corporation Site

Hicksville, New York

May 9, 2017

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Table of Contents

Figures

Tables

Appendices

Professional Engineer Certification

I certify that I am an engineer licensed in the State of New York who has received a baccalaureate and post-graduate degree in engineering and have sufficient training and experience in remediation, groundwater hydrology, and related fields, as demonstrated by state registration and completion of accredited university courses, which enable me to make sound professional judgments regarding engineering design. I further certify that this report, *Sub-Slab Depressurization System Construction Completion Report*, dated May 9, 2017, was prepared under by direction.

James A. Sobieraj, P.E.
P.E. 077394-1

5/9/2017
Date

STATE OF NEW YORK
JAMES ALLEN SOBIERAJ
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LICENSED PROFESSIONAL ENGINEER

1 Introduction

On behalf of Vishay GSI, Inc. (VGSI) and at the request of the New York State Department of Environmental Conservation (NYSDEC), WSP prepared this sub-slab depressurization (SSD) system construction completion report for the former General Instrument Corporation (GIC) site in Hicksville, New York. Remedial work at this site is being conducted by VGSI, the corporate successor to GIC, in accordance with the Order on Consent (#W1-0236-88-07) signed by GIC on December 4, 1989, and the NYSDEC on January 16, 1990.

The SSD system was installed to create a negative pressure differential below the building slab, thereby mitigating potential vapor intrusion from the sub-slab to indoor air. SSD system installation was completed in substantial conformance with the *Soil Vapor Intrusion Mitigation Plan*, dated February 19, 2016, which was approved by the NYSDEC in correspondence dated April 22, 2016. Field changes to the approved design are documented in this report. All work was performed in accordance with a site-specific health and safety plan (HASP).

Construction of the SSD system was completed between May 4 and July 1, 2016, and SSD system startup activities were completed on July 12-13, 2016. Following startup, the system was placed in full-time operation. Minor modifications were made to the system during the week of December 5, 2016 to improve system efficiency. Post-mitigation indoor air sampling was conducted on March 21, 2017.

This report was prepared in accordance with the NYSDEC's *Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York* and the New York State Department of Health's (NYSDOH's) *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, both dated October 2006.

1.1 Report Organization

The remainder of this report consists of Sections 2 through 8:

- Section 2 presents the site background.
- Section 3 details the SSD system installation, including mobilization, SSD point installation, piping installation, equipment installation, and site restoration.
- Section 4 provides a summary of the SSD system testing and startup activities, including modifications completed in December 2016 to improve system efficiency, and describes requisite permitting and waste management.
- Section 5 describes post-mitigation monitoring conducted in March 2017.
- Section 6 describes additional reporting associated with the administrative closure of OU1.
- Sections 7 and 8 present acronyms and references used in this report.

As-built drawings for the SSD system are provided in Appendix A, and photographs of the completed system are provided in Appendix B. Manufacturer's specifications sheets and manuals are provided in Appendix C.

2 Background

2.1 Site Description and History

The former GIC site is located at 600 West John Street, northeast of the intersection of West John Street and Cantiague Rock Road in Hicksville, New York (Figure 1). The 11.5-acre site is located in a light industrial section of Hicksville and was developed in 1960 for General Transistor, who was subsequently acquired by GIC. GIC used the facility, including two one-story buildings and one two-story building, for the research, design, and manufacture of semiconductors, radar systems, and electronic equipment until operations ceased in 1994. 600 West John LLC, an unaffiliated company, currently owns the property and leases the buildings to industrial and commercial tenants. Figure 2 presents the facility layout.

2.2 Building Description and Occupancy

The building layout presented in Figure 2 incorporates the findings of various building inspections conducted at the site since 2013, and includes active tenants at the time of post-mitigation indoor air sampling in March 2017.

The building is constructed of cinder block walls with a corrugated metal ceiling. The floor is concrete on grade with no basements except for a subgrade utility tunnel that runs north to south under the building approximately 120 feet west of the eastern building wall. The building is presumed to have concrete wall and column footers extending to approximately 5 feet below grade. The warehouse space throughout the building is equipped with several natural-gas-fired overhead space heaters and roof-mounted ventilation units.

At the time of system installation, three tenants occupied the SVI mitigation area shown on Figure 2. Sid Harvey Industries (SHI), a heating, ventilation, and air conditioning (HVAC) equipment wholesaler, occupied space in the western part of the 1960 original building, including a storefront in the southern portion of the space. The storefront was used for equipment sales, and the northern space was used for receiving and storing HVAC supplies. The equipment sales area was the only space that is continuously occupied by employees. The Daily News occupied the eastern part of the original 1960 building and utilized the space for temporary newspaper storage and distribution. Empire Sports occupied the western portion of the 1967 two-story addition and utilized the warehouse space on the first floor for receiving, storage, and distribution of footwear. The first-floor office area in the southern portion of the 1967 addition, the eastern portion of the 1967 addition, and the 1968 addition were vacant at the time of the SSD installation.

At the time of this report, Daily News no longer leases space in the building, and Dicom Express Freight Services now operates a distribution center in the eastern warehouse space. The other tenants remain in the same locations as described above.

2.3 Summary of Vapor Investigation and Mitigation Activities

Conditions at the site have been investigated since 1981, when chlorinated volatile organic compounds (VOCs) were identified in groundwater beneath the site. As a result of two Orders of Consent signed by the NYSDEC and GIC, two operable units (OU1 and OU2) were defined: OU1 refers to affected onsite soil, and OU2 refers to affected groundwater.

In 1994, a soil vapor extraction (SVE) system was installed as an interim remedial measure to address OU1. A Record of Decision for OU1 was later issued in 1997, requiring SVE for treatment of onsite soils. As a result, the existing system was upgraded. Based on closure testing and indoor air investigations completed in 2001 and 2002, Areas B (a former 1,000-gallon underground storage tank on the west side of the property) and C (a sump in an underground tunnel) were permanently closed with the approval of the NYSDEC in 2003. However, at that time the closure testing also indicated that continued operation in Area A was still producing benefits. Area A is the location of a former 2,000-gallon underground storage tank previously located outside the northwest corner of the 1968 building addition. Modifications to the SVE system were performed in 2003 and 2011, and the SVE system continued to operate in Area A[1] until September 2012. On January 21, 2013, WSP submitted an SVE system closure sampling report to the NYSDEC. The report concluded that operation of the SVE system has achieved the soil remedial goals in Area A. Because sample results from September 2012 did not exceed any of the soil cleanup objectives (SCOs), the SVE system has not been restarted and remains off.

On September 6, 2013, WSP submitted a work plan to the NYSDEC to conduct a soil vapor intrusion (SVI) investigation designed to evaluate the SVI risk at the site following the achievement of the SCOs and associated shutdown of the SVE system in Area A. As described in the *Soil Vapor Intrusion Investigation Report – Second Round of Site-Wide Sampling* dated April 2, 2015, SVI investigation sampling demonstrated that SVI mitigation was warranted in portions of the building to address sub-slab soil gas concentrations attributable to the regional VOC plumes in groundwater that underlie the site and the surrounding area. The report concluded that mitigation was warranted in portions of the building near sampling locations SS-3, SS-4, and SS-8, and recommended monitoring in the remainder of the building near sampling locations SS-2, SS-5, SS-6, and SS-7 (Figure 2). The report was approved by the NYSDEC in a letter dated June 12, 2015.

On September 25, 2015, WSP submitted a work plan to the NYSDEC to conduct an SVI mitigation pilot test in order to determine whether an SSD system would be an effective method to mitigate potential vapor intrusion and, if so, to gather the technical data needed to design an SSD system. The work plan was approved by the NYSDEC in a letter dated October 5, 2015. An SVI mitigation pilot test was conducted during the week of December 14, 2015, in accordance with the NYSDEC-approved work plan. The pilot test indicated that an SSD system would be an effective method to prevent infiltration of vapors into the building.

On February 19, 2016, WSP submitted a *Soil Vapor Intrusion Mitigation Plan* to the NYSDEC. The plan detailed the findings of the December 2015 pilot test, outlined SSD system design criteria and rationale, and described the recommended SVI mitigation measures, including installation of an SSD system in affected portions of the building.

The *Soil Vapor Intrusion Mitigation Plan* was approved by the NYSDEC without comment in a letter dated April 22, 2016. System installation was completed between May 4 and July 1, 2016, with additional modifications completed during the week of December 5, 2016. Post-mitigation indoor air sampling was conducted on March 21, 2017. System installation activities and as-built system configuration are described in the following sections.

[1] Except between November 30, 2009 and June 8, 2011, when the blower failed and subsequent investigations and modifications to the SVE system were conducted in Area A.

3 SSD System Installation Activities

This section provides a description of SSD system installation activities. During construction, WSP provided full-time oversight for the work performed by the various subcontractors, and ensured substantial conformance with the NYSDEC-approved plan. Minor deviations from the NYSDEC-approved plan are summarized in Section 3.2. The primary SSD system construction phases included:

- Site preparation, including pre-mobilization site walks with the contractors and property owner representatives, as well as locating and marking all utilities within the work areas (Section 3.3)
- Installing SSD extraction points (Section 3.4)
- Installing risers and overhead conveyance piping (Section 3.5)
- Installing SSD equipment, including retrofitting existing equipment and installing new equipment as necessary (Section 3.6)
- Sealing the building slab and site restoration (Section 3.7)

Drilling activities were conducted by Zebra Technical Services, LLC, of Lynbrook, New York, a New York-licensed drilling company (now Cascade Technical Services; License #NYRD10899). SSD system piping was installed by EAI, Inc. of Jersey City, New Jersey. SSD system equipment repair/replacement, hookup, and commissioning were conducted by Berkshire Environmental Services and Technology, LLC (BEST), of Torrington, Connecticut.

A general introduction to the design and layout of the system is presented below, followed by a detailed description of each phase of work.

3.1 SSD System Design and Layout

As detailed in the NYSDEC-approved mitigation plan, the following considerations and design parameters were incorporated into the SSD system design, based on findings from the December 2015 pilot test:

- The design flow rate, based on flow rates achieved during pilot testing, was 10 standard cubic feet per minute (scfm) per foot of well screen at a vacuum of 40 inches of water column (inch WC) at the wellhead. The design radius of influence (ROI), based on analysis of pilot test data, was 32 feet; however, increased influence is expected as soil moisture is removed by continuous operation of the SSD system.
- A communication barrier is assumed to exist between the 1960 original building and the 1967 addition. To account for potential operational differences between the two phases of the building, the 1960 original building and the 1967 addition are connected to different headers (designated “Header AB” and “Header CD”, respectively) with butterfly valves at the system manifold to adjust vacuum and flow levels to each section of the building.
- With a design ROI of 32 feet, each SSD point will induce vacuum over an area of approximately 3,200 square feet. The mitigation area encompasses an area of approximately 88,000 square feet. Accordingly, 29 SSD points were installed adjacent to building columns throughout the mitigation area, which combined should have the capacity to provide sub-slab depressurization over an area of 92,800 square feet. Capped tees were installed on the system headers to allow for the installation of additional SSD points if post-installation testing demonstrated “dead zones” in sub-slab vacuum. Based on testing conducted during system startup (Section 4.1), no additional SSD points were required.
- SSD points were installed in conventional stone-filled SSD pits in most locations in order to improve the induced vacuum field beneath the slab and to allow water vapor condensation infiltration back into the subsoil. However, in locations where field observations indicated that subsurface materials immediately beneath the slab may not be conducive to depressurization (i.e., within a silty sand or clayey sand lenses identified in historical boring logs), SSD points were installed using an alternative construction. The alternative construction incorporates elements of SSD and SVE vacuum application points and includes polyvinyl chloride (PVC)

screen within a sandpack to increase the likelihood of inducing sufficient vacuum and achieving the design ROI around the point. Two SSD points were installed in this manner.

As-built drawings detailing the completed construction of the SSD system are provided as Sheets 1 through 5 in Appendix A:

Sheet 1:	Title Sheet
Sheet 2:	As-Built SSD System Configuration
Sheet 3:	Construction Details
Sheet 4:	System Commissioning Data
Sheet 5:	Piping & Instrumentation Diagram

3.2 Exceptions to the Approved Design

The SSD system was installed in substantial conformance to the NYSDEC-approved design, with minor exceptions described below.

- Before construction began, WSP conducted site walks with the various contractors and property owner representatives to discuss SSD point locations, pipe runs, and logistics to ensure that the system would not interfere with facility operations. In consultation with the property owner representative, the following modifications were made to the system design before contractors mobilized to the site:
  - The pipe run for Header D was moved to the west to run next to Header C
  - SSD-A3 and SSD-B3 were moved to the other side of the wall, from the SHI space to the Daily News space
  - The location for SSD-D6 was moved from the Empire Sports space to the vacant warehouse, and was moved to a different column due to the presence of a roof drain at its original location
  - SSD points on lines C and D were renamed based on reallocation of points between the two lines
  - SSD-D3 (designated SSD-D4 in the design drawings) was moved to a different (adjacent) column due to the presence of a roof drain at its original location
  - SSD-C3 (designated SSD-C2 in the design drawings) was moved to the other side of the wall, from the Empire Sports area to the vacant office area
- The approved design indicated that the pipe runs for Headers AB and CD would be routed outside the building along the roof. At the property owner representative's request, these lines were instead routed inside the building.
- The approved design indicated that SSD point piping less than 5 feet above grade would be protected with 4-inch inner diameter (ID) hubless cast iron soil pipe. At the property owner representative's request, piping in SHI, Daily News, and the vacant warehouse spaces was instead protected using bollards placed at locations approved by the property owner representative (Section 3.5.1).
- Ball valves were installed on all SSD risers to enable pressure testing to be completed and to allow points to be isolated as needed during system operation.

These changes did not affect the performance of the SSD system, and are reflected in the subsequent sections and in the as-built drawings included in Appendix A.

3.3 Site Preparation

Mobilization activities included shipping and staging equipment and materials to the site, and evaluating equipment from the former SVE system for potential reuse. Construction materials and piping were stockpiled in a vacant portion of the building adjacent to the SSD system equipment area. Underground utilities were cleared in the vicinity of all SSD points by On Point Locating of Holbrook, New York.

3.4 Installation of SSD Points

The SSD points were installed from May 9-19, 2016, by Zebra Technical Services, LLC (now Cascade Technical Services), of Lynbrook, New York. Twenty-nine SSD points were installed throughout the mitigation area, including:

- 4 in the SHI leased space
- 12 in the Daily News leased space
- 4 in the vacant office space
- 8 in the Empire Sports leased space
- 1 in the vacant warehouse

Locations of the SSD points are presented on Sheet 2 of the as-built drawings. SSD points were installed as close to existing building columns or walls as possible at locations agreed upon by an authorized property owner representative.

SSD points were installed by saw cutting through the existing concrete floor at each location, then by using a hand auger to install soil borings to a termination depth of 5 feet below finished floor (bff) to enable WSP's onsite hydrogeologist to assess the sub-slab conditions at each point. After each boring was completed, WSP's onsite hydrogeologist determined whether a "standard" or an "alternative construction" SSD extraction point would be installed at that location, based on sub-slab conditions encountered. Sheet 3 of the as-built drawings illustrates typical standard and alternative construction SSD extraction point details.

- Standard construction SSD points were constructed by backfilling the boring with soil cuttings from the boring, then by hand digging an SSD suction pit beneath the slab to a minimum depth of 10 inches below the bottom of the slab. The contractor lined the base and sides of the pit with a 6-ounce non-woven geotextile liner, and backfilled the suction pits using 3/8-inch sorted (no fines), washed crushed stone.
- Alternative construction SSD points were installed in locations where sub-slab materials consisted of silty or clayey sand that may inhibit sub-slab communication. Alternative construction SSD points were installed by reaming the boreholes to a diameter of approximately 6 inches using a hand auger. Wells were then constructed by installing flush-threaded 0.020-inch slotted schedule 40 PVC well screen from the bottom of the point to approximately 2 inches below the bottom of the slab. The well screen was attached to enough blank schedule 40 PVC riser to rise at least 2 feet above the floor surface to enable the piping contractor to easily tie the points into the SSD risers. A sand filter pack was installed to a level approximately 10 inches below the bottom of the slab. The contractor hand dug an SSD suction pit beneath the slab to a minimum depth of 10 inches below the bottom of the slab. The suction pit was lined with a 6-ounce non-woven geotextile liner, and backfilled using 3/8-inch sorted (no fines), washed crushed stone.

At the discretion of WSP's oversight hydrogeologist, 27 standard and 2 alternative construction SSD points (SSD-A4 and SSD-A5) were installed.

3.5 Piping Installation

SSD system piping was installed by EAI, Inc. of Jersey City, New Jersey between June 15 and July 1, 2016. System piping included SSD extraction point installation at each of the 29 previously installed SSD extraction pits, as well as vacuum conveyance piping installation from the network of SSD points to the system equipment enclosure located outside the northwest corner of the building.

3.5.1 Sub-Slab Depressurization Extraction Point Installation

SSD extraction points were constructed of 2-inch diameter PVC casing. Standard construction SSD extraction points were installed at a nominal depth of 2 inches below the bottom of the slab, with a 1/8-inch mesh screen secured to the inlet side of the SSD point. Alternative construction SSD extraction points were constructed by attaching 2-inch diameter PVC casing to the SSD risers previously installed by the drilling contractor.

Risers were secured to the nearest column or wall. Vacuum gauges (0 to 60 inches WC) were installed at each SSD point to measure and confirm the presence of a vacuum. Butterfly valves were installed to regulate the vacuum applied to each point, and ball valves were installed to enable individual points to be shut off entirely if necessary. Schematics showing the specific details of the SSD risers are provided on Sheet 3 of the as-built drawings.

Slab penetrations were sealed with non-shrink grout meeting ASTM C1107-14a Grade C. The surface of the replacement pavement was finished flush with the surface grade of the surrounding pavement and finished to match surrounding surfaces.

Brightly colored 36-inch-high welded steel bollards were installed to protect the SSD risers at the floor level. Bollards were installed at locations approved by WSP's oversight engineer and the property owner's onsite representative, with the following exceptions at the property owner's request:

- Bollards were not installed in the vacant office area (points SSD-C1, SSD-C2, SSD-C3, and SSD-D1). The property owner representative indicated that walls would be constructed around the risers, including access panels to allow access to system instrumentation as needed for system operations and maintenance.
- SSD risers in the area occupied by Empire Sports (points SSD-C4, SSD-C5, SSD-C6, SSD-C7, SSD-D2, SSD-D3, SSD-D4, SSD-D5) were protected from the floor surface to approximately 5 feet above the floor by 3-inch diameter steel pipe in lieu of bollards due to limited floor space. The space between the steel pipe and PVC riser was sealed using an expanding polyurethane insulating foam, cut flush with the pipe end.

3.5.2 Vacuum Conveyance Piping Installation

Vacuum conveyance piping was installed from each of the 29 SSD points to the equipment enclosure located outside the northwest corner of the building, following the piping route presented on Sheet 2 of the as-built drawings. Overhead piping inside the building was constructed of 2-inch, 4-inch, and 6-inch diameter schedule 40 PVC, supported from the roof rafters and trusses using unistrut and threaded rod hardware.

All points of the pipe run were sloped to drain back to the vapor extraction point where feasible or to the SSD system equipment enclosure at the northern portion of the building. At locations where maintaining such a slope was not feasible, pipe sumps and drains were installed at low points in accordance with the detail on Sheet 3 of the as-built drawings. Locations of pipe sumps and drains are shown on Sheet 2.

3.5.3 Pressure Testing

Following the installation of the vacuum conveyance piping network, all piping and fittings were pneumatically pressure-tested by pressurizing each line with compressed air. Piping was pressurized to a minimum of 6 pounds per square inch (psi). If a pressure drop of more than 10% of applied pressure was observed over a one-hour period, each segment was isolated and pressurized to identify the location of the leak, repaired, and retested.

3.6 SSD System Equipment Installation

System equipment still onsite from the former SVE system was evaluated for potential use for the operation of the SSD system. The SVE blower was no longer operational and was replaced. Other existing SVE equipment was functional and plumbed into the SSD system as described below and shown on Sheet 5 of the as-built drawing package.

1. Air/water separator: Extracted vapors from the subsurface first pass through an air/water separator equipped with a water level site glass and vacuum gauge. Water collected in the air/water separator is pumped to a

storage tank when the high water level switch is activated. When the storage tank nears capacity, water is manually discharged to the sanitary sewer (see permitting discussion in Section 4.2.2). The air/water separator and storage tank are equipped with high water level switches that shut down the SSD system as a precaution to prevent overfilling the tanks.

2. Regenerative blower: The blower used for the SSD system is an Ametek Rotron model EN909 regenerative blower. The blower is equipped with an inlet bleed valve, bleed air filter, particulate filter, a vacuum relief valve, and an exhaust silencer. A differential pressure switch on the inlet side of the blower shuts down the system in the event of loss of vacuum.

3. Heat exchanger: An air-to-air heat exchanger associated with the former SVE system is connected to the discharge side of the blower. As part of the former SVE system, the heat exchanger cooled the extracted vapors to improve adsorption capacity of the vapor-phase granular activated carbon (GAC), which was also part of the SVE system. As described in Section 4.1, extracted vapor sampling results demonstrate that treatment of the extracted vapor stream is not required for the SSD system; and therefore, WSP anticipates removing the heat exchanger from the equipment train in the future after approval of this report by the NYSDEC.

4. System telemetry: A Sensaphone Sentinel Monitoring System with a cellular connection was connected to the system and set up to notify WSP of any alarm conditions. In the event of an alarm condition, including a loss of power or vacuum to the system, WSP's project engineer is immediately notified via email and SMS (text message).

Flow sensors with differential pressure gauges are installed on Headers AB and CD, as well as on the combined piping after the manifold. Vacuum gauges are installed on Headers AB and CD, at the air/water separator, and on the inlet side of the blower after the particulate filter. Pressure and temperature gauges are installed on the outlet side of the blower on either side of the heat exchanger.

System exhaust is conveyed to a 4-inch-diameter PVC exhaust stack mounted to the northwest corner of the building, and extends above the roof of the building. In accordance with Section 4.2.2 of the NYSDOH guidance, the exhaust stack is at least 12 inches above the surface of the roof; 10 feet above ground level; 10 feet away from any opening that is less than 2 feet below the exhaust point; and 10 feet from any adjoining or adjacent buildings, or HVAC intakes or supply registers. The exhaust stack is equipped with a tee to prevent accumulation of rainwater.

3.7 Building Sealing and Site Restoration

Accessible concrete floor expansion joints and significant cracks were sealed in order to improve the effectiveness of depressurization. Sealing consisted of cleaning out the joints using compressed air, and filling in those joints and cracks with a low-VOC caulk. Building sealing was completed by EAI, Inc. of Jersey City, New Jersey during piping installation.

Areas that were disturbed as a result of site activities were restored to original, pre-construction conditions before the contractors demobilized from the site.

4 System Commissioning

System commissioning was conducted after system installation was complete. The objectives of system commissioning were to:

- Confirm that the system was constructed as designed
- Check that the equipment operated as specified
- Make any necessary modifications in the system based on observations of site conditions that were different than expected during system installation
- Gather and evaluate initial operational data

4.1 System Startup and Monitoring

Full-time operation of the SSD system commenced on July 12, 2016. A pre-commissioning check consisting of a visual inspection was conducted to verify that all components of the system were properly installed. Functional performance tests were carried out to ensure that system equipment was operational. The system was then started without extracting any soil vapor by closing the main manifold valves and by opening the inlet bleed valve to the ambient air. Vacuum was then increased incrementally to ensure proper operation.

Once the system was running at the expected operating conditions, flow and vacuum at each SSD point were measured and recorded to establish an operational baseline. Baseline measurements were repeated on July 13, 2016, following 24 hours of system operation. Baseline measurements are presented in Table 1.

Smoke tubes were then used to check for leaks through concrete cracks, floor joints, and at each suction point. All identified leaks were sealed using low-VOC caulk until smoke was no longer observed flowing through the opening.

A vacuum field extension test was conducted to confirm that a sub-slab vacuum had been achieved throughout the mitigation area. The test was conducted by operating the SSD system and simultaneously measuring the vacuum in small (3/8-inch or 7/8-inch) holes drilled through the slab. Vacuum at each location was measured with a digital micromanometer. Twenty-three test points (designated T-1 through T-23) were installed throughout the mitigation area at locations shown on Sheet 4 of the as-built drawings. The measured sub-slab vacuum varied from 0.010 inch WC to 0.476 inch WC, and demonstrated that a vacuum had been created beneath the entire slab within the mitigation area. Following the completion of vacuum field extension test activities, the holes were patched with cement grout.

A system exhaust sample was collected to confirm that VOC emissions do not exceed 0.5 pounds per hour (lb/hr). The sample was collected using an evacuated 1-liter Entech Instruments, Inc. canister and analyzed by Centek Laboratories of Syracuse, New York for VOCs, including dichlorobenzenes, using US EPA Method TO-15. Analytical results are presented in Table 2, and the laboratory report is included in Appendix D. Tetrachloroethene (PCE) and trichloroethene (TCE) were detected at 2,000 and 2,500 $\mu g/m^3$, respectively, which are similar concentrations to historical pre-mitigation sub-slab vapor results as shown on Figure 2.

Following a number of rain events, WSP was contacted by a property owner representative regarding a drop in observed vacuum in two of the four legs of the system. Based on an analysis of the system and building layout, WSP determined that roof drains on one side of the building were a source of storm water that was migrating beneath the slab and being pulled into the system piping, resulting in the observed reduction in vacuum in this part of the system. WSP evaluated the system piping and determined that minor modifications to low points in the system manifold after the piping headers exit the building would resolve the issue. Piping modifications were completed during the week of December 5, 2016. The as-built drawings reflect the final modified piping layout.

4.2 Permits

4.2.1 Air Permits

WSP contacted Mr. Robert DeCandia of the NYSDEC to determine whether an air permit would be required for emissions from the SSD system. In an email dated February 9, 2015, Mr. DeCandia indicated that emissions from vapor mitigation systems are considered a “trivial activity,” as defined in Part 201-3.3, Category 29 (air strippers and soil vents), and are therefore exempt from state air permitting requirements established by the Division of Air. Off-gas treatment for vapor mitigation systems is generally not required as long as it does not exceed the threshold of 0.5 lb/hr of total VOCs established by the NYSDEC Division of Environmental Remediation (DER) to meet air pollution control guidelines.

As described in Section 4.1, a system exhaust sample was collected once the SSD system was operational. Analytical results of the system exhaust sample and measured flow rates for the SSD system were used to calculate VOC emissions for the SSD system. Calculated emissions are 0.0086 lb/hr of VOCs (Table 3), well below the 0.5 lb/hr limit established by DER. Off-gas treatment is therefore not required, and upon approval of this report by the NYSDEC, WSP anticipates decommissioning the two GAC units associated with the former SVE system.

4.2.2 Special Sewer Use Permit

Accumulated water associated with historical operation of the SVE system has been discharged via a manhole (MH-2) located on the former GIC property with the approval of the Cedar Creek Water Pollution Control Plant (WPCP), operated by the Nassau County Department of Public Works (DPW), since 2003. Similar to the former SVE system, WSP anticipates the SSD system to generate a small volume of water from condensate and storm water uptake during rain events.

Water samples will be collected from the 1,000-gallon storage tank on an as-needed basis using a port located on the discharge side of the transfer pump. The water sample will be analyzed for VOCs using EPA Method 8260. The data will be provided to the DPW and, with their approval, the water will be discharged to the sanitary sewer. The first approved discharge took place on December 20, 2016. Analytical results and the DPW approval letter for the discharge are provided in Appendix E.

4.3 Waste Management

Soil and debris generated during SSD installation activities was placed in Department of Transportation (DOT) authorized 55-gallon drums. The drums were labeled and staged onsite for subsequent characterization and disposal in accordance with state and federal regulations.

5 Post-Mitigation Sampling

On March 21, 2017, post-mitigation indoor and outdoor air samples were collected in all locations where pre-mitigation samples were collected, using the same sampling protocols and analytical methods that were used during the January and December 2014 SVI investigations.

Building occupancy and use at the time of the March 2017 sampling event were similar to the January and December 2014 SVI investigations, with the exception that Dicom had moved into the formerly vacant warehouse space, and Daily News had moved out of eastern part of the original 1960 building. During WSP's time onsite to conduct the sampling, WSP observed cargo deliveries from semi-trailers backed up to the loading docks on the north end of the Dicom-occupied space. The contents of the trailers were offloaded using propane-fueled forklifts and hand-operated pallet jacks. Deliveries were sorted, passed onto a large central conveyor belt, then loaded into cargo vans for transport to their destinations. Diesel odors were observed in the space, along with oil staining on the pavement where vans had been parked. WSP monitored indoor air using a photoionization detector (PID), and observed readings were consistently in the 0-2 part per million (ppm) range.

5.1 Sampling Procedures

Seven indoor air samples (IA-2 through IA-8) were collected inside the building at the same locations where pre-mitigation samples were collected during the December 2014 SVI investigation. One outdoor air sample, designated OA-1, was collected concurrently with the indoor air samples to evaluate the potential influence, if any, of outdoor air quality on indoor air quality. The sample was collected from outside the building in a representative upwind location (Figure 2).

All indoor and outdoor air samples were collected from approximately 3 feet above the ground to sample air from the typical breathing region. The air samples were collected using evacuated 1-liter Entech Instruments, Inc. canisters fitted with dedicated flow controllers that were preset by the laboratory to collect the samples over 8 hours. After 8 hours, the regulators were disconnected from the canisters, and the sample names, locations, times and dates of sample collection, sample regulator and canister numbers, and the analytical method were recorded on the chain-of-custody form and in the field log book.

5.2 Quality Assurance/Quality Control

The Entech canisters used for the sampling activities were certified-clean by the laboratory. To evaluate the potential for sample cross-contamination during shipment or during sample collection, a laboratory-prepared trip blank also accompanied the sample canisters for the indoor air samples from the laboratory to the field and from the field to the laboratory.

A blind duplicate sample was collected to evaluate the reproducibility of the sample collection and analytical procedures. Sample IA-100 is a duplicate of IA-5.

5.3 Sample Analysis

All samples were shipped under ambient conditions to Centek Laboratories of Syracuse, New York, a NYSDOH Environmental Laboratory Approval Program-approved laboratory, under strict chain-of-custody procedures. The samples were analyzed for VOCs, including dichlorobenzenes, using US EPA Method TO-15 within applicable holding times. The minimum reporting limits using EPA Method TO-15 were no greater than 0.25 micrograms per cubic meter (µg/m^3) for TCE and carbon tetrachloride and 1 µg/m^3 for all other VOCs[2]. The laboratory analytical report is provided in Appendix F, and the data usability summary report is provided in Appendix G.

[2] The reporting limit exceeded 1 µg/m^3 for the following VOCs (reporting limits in parentheses): 1,2,4-Trichlorobenzene (1.1 µg/m^3), 1,2-Dibromoethane (1.2 µg/m^3), 1,4-Dioxane (1.1 µg/m^3), Bromoform (1.6 µg/m^3), Dibromochloromethane (1.3 µg/m^3), Freon 113 (1.1 µg/m^3), Hexachloro-1,3-butadiene (1.6 µg/m^3), m&p-Xylene (1.3 µg/m^3), Methyl Butyl Ketone (1.2 µg/m^3), and Methyl Isobutyl Ketone (1.2 µg/m^3). No indoor air guidelines are established for these VOCs, nor are they contaminants of concern at the site.

5.4 Analytical Results

Table 4 presents the results for VOCs detected in the March 2017 samples above reportable limits, along with the available NYSDOH guidelines for volatile chemicals in air. The purpose of these guidelines is to assist with the decision-making process when evaluating the nature and extent of actions needed to reduce exposure to the chemicals detected; these guideline values are not regulatory standards. Figure 2 summarizes the PCE and TCE results for both the pre-mitigation (January and December 2014) and post-mitigation (March 2017) sampling events.

TCE was detected in one of the seven indoor air samples, at a concentration of 1.7 µg/m^3 (IA-8). TCE was also detected in the outdoor air sample at a concentration of 0.86 µg/$m^{3.}$ Both concentrations are below the NYSDOH guideline value for TCE (2 µg/m^3).

PCE was detected in two of the seven indoor air samples, at concentrations of 1.4 µg/m^3 (IA-8) and 0.95 µg/m^3 (estimated; IA-3). PCE was not detected in the outdoor air sample. Both concentrations are below the NYSDOH guideline value for PCE (30 µg/m^3).

5.5 Evaluation of Results

WSP evaluated the cumulative analytical vapor data by comparing pre-mitigation (January and December 2014) and post-mitigation (March 2017) results to the available NYSDOH guidelines. TCE was detected in five of the eight indoor air samples collected in December 2014, at concentrations ranging from 0.27 to 5.4 µg/m^3; by contrast, TCE was only detected in one indoor air sample collected in March 2017 (IA-8). At this IA-8 location the pre- to post-mitigation results decreased significantly from 5.4 to 1.7 µg/m^3. PCE was detected in two of the eight indoor air samples collected in both December 2014 and March 2017 (IA-3 and IA-8); albeit at significantly lower concentrations in the March 2017 samples as shown on Figure 2.

TCE and PCE were detected in post-mitigation indoor air samples collected from within the SHI warehouse (location IA-3) and storefront (IA-8). A product inventory was completed for these areas in December 2014, and included as Enclosure A of associated SVI investigation letter report (WSP 2015a). For convenience, the product inventory is also included as Appendix H. The inventory noted that several products contained PCE or TCE, which may have contributed to the PCE and TCE concentrations detected in indoor air samples IA-3 and IA-8. Use of these spaces has not changed since the product inventory was completed. The outdoor air sample OA-1 also contained TCE at a concentration (0.86 µg/m^3) of similar magnitude to the result inside the SHI store (1.7 µg/m^3 in IA-8). The TCE concentration detected in IA-8 may also be partially attributable to outdoor air (containing TCE) entering the SHI store as customers enter and leave the space throughout the day.

Post-mitigation sampling demonstrated that the SSD system has successfully reduced indoor air concentrations of TCE and PCE to levels below NYSDOH guidelines and has effectively mitigated the risk of infiltration of VOCs from the sub-slab soil gas to indoor air.

6 Additional OU1 Closure Reporting

With the former SVE system having achieved the SCOs in soil, and the SSD system installed to mitigate long-term SVI concerns, final remedial action for OU1 is complete, and WSP will prepare the requisite documents to administratively close OU1 in accordance with the NYSDEC's *Technical Guidance for Site Investigation and Remediation* (DER-10).

WSP will prepare and submit to the NYSDEC an OU1 Completion Report, which will be a comprehensive report on all OU1 remedial actions, including summaries of the former SVE system operation, soil closure sampling events, and installation of the SSD system. WSP will also prepare and submit a separate interim site management plan (SMP), which will include the operation, maintenance, and monitoring (OM&M) protocols for the SSD system in accordance with Section 4.4 of the NYSDOH guidance, and an institutional and engineering control (IEC) plan.

In accordance with Section 5.6 of the NYSDOH guidance, an SVI mitigation information package will be prepared for distribution to the building's owners and tenants as appropriate to facilitate their understanding of the system's operation, maintenance, and monitoring.

In 2017, the system controls will be upgraded to include a programmable logic controller (PLC) with remote monitoring and added telemetry. These upgrades will be included in a future addendum to this report, and will be incorporated into the interim SMP and SVI mitigation information package as appropriate.

7 Acronyms

µg/m^3	micrograms per cubic meter
BEST	Berkshire Environmental Services and Technology, LLC
bff	below finished floor
DER	Division of Environmental Remediation
DOT	Department of Transportation
DPW	Department of Public Works
EPA	Environmental Protection Agency
GAC	granular activated carbon
GIC	General Instrument Corporation
HASP	health and safety plan
HVAC	heating, ventilation, and air conditioning
ID	inner diameter
IEC	institutional and engineering control
inch WC	inches of water column
lb/hr	pounds per hour
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OM&M	operations, maintenance, and monitoring
OU	operable unit
PCE	tetrachloroethene
PID	photoionization detector
PLC	programmable logic controller
ppm	parts per million
psi	pounds per square inch
PVC	polyvinyl chloride
ROI	radius of influence
scfm	standard cubic feet per minute
SCO	soil cleanup objective
SHI	Sid Harvey Industries
SMP	site management plan
SSD	sub-slab depressurization
SVE	soil vapor extraction
SVI	soil vapor intrusion
TCE	trichloroethene
VGSI	Vishay GSI, Inc.
VOC	volatile organic compound
WPCP	water pollution control plant

8 References

NYSDEC. 2006. “DER-13 / Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York”. October 18.

NYSDEC. 2010. “DER-10 / Technical Guidance for Site Investigation and Remediation. May 3.

NYSDOH. 2006. “Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York”, Center for Environmental Health, Bureau of Environmental Exposure Investigation. October 2006.

WSP. 2013a. Letter from Mr. James A. Sobieraj, P.E., to Mr. Robert D. DeCandia, Jr., P.E., Environmental Engineer II of the NYSDEC regarding Operable Unit 1, SVE System Closure Sampling in Area A, Former General Instrument Corporation Site, Hicksville, New York. January 21.

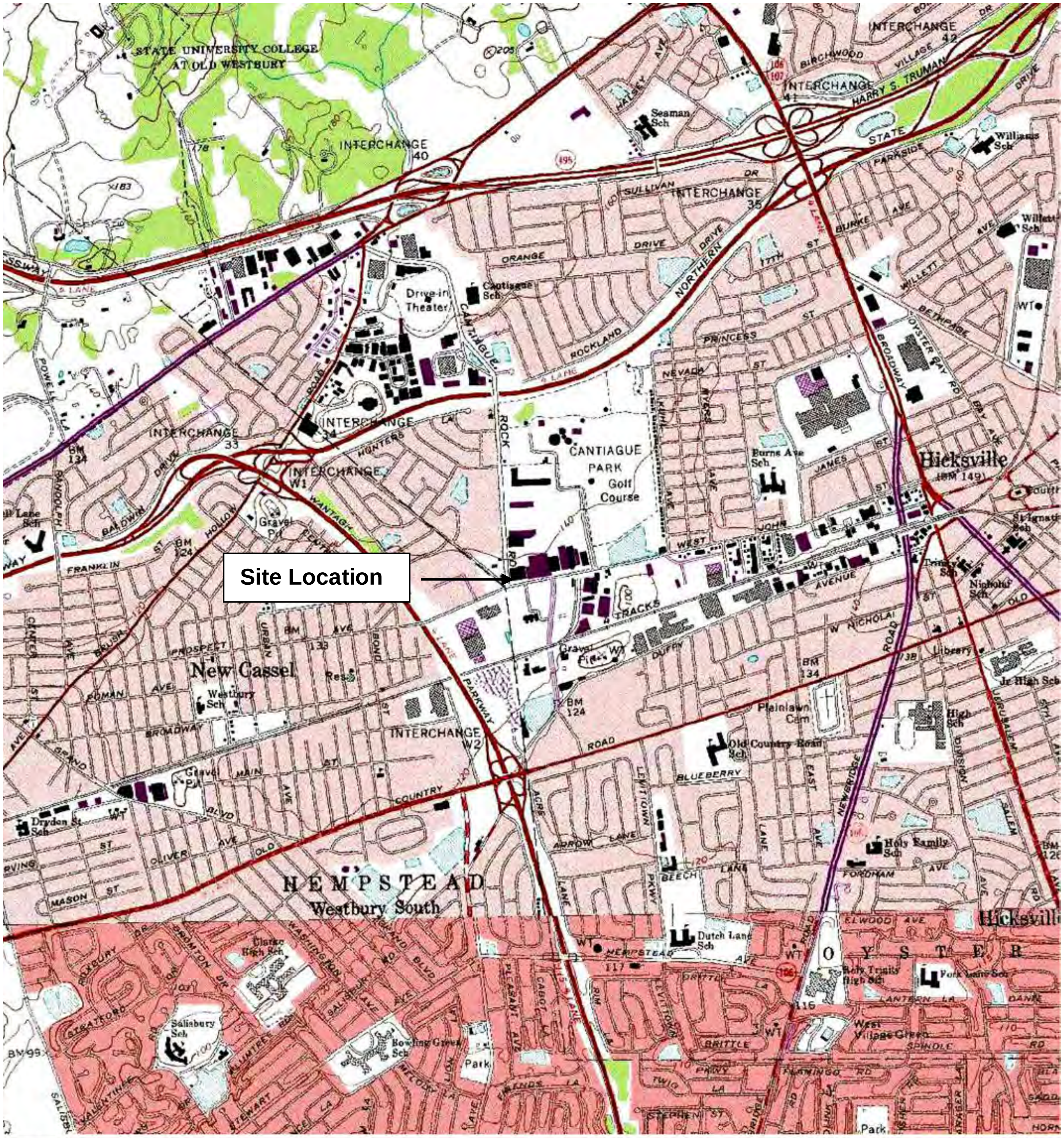
WSP. 2013b. Letter from Mr. James A. Sobieraj, P.E., to Mr. Robert D. DeCandia, Jr., P.E., Environmental Engineer II of the NYSDEC regarding Soil Vapor Intrusion Investigation Work Plan, Former General Instrument Corporation Site, Hicksville, New York. September 6.

WSP. 2015a. Letter from Mr. James A. Sobieraj, P.E., to Mr. Robert D. DeCandia, Jr., P.E., Environmental Engineer II of the NYSDEC regarding Soil Vapor Intrusion Investigation Report – Second Round of Site-Wide Sampling, Former General Instrument Corporation Site, Hicksville, New York. April 2.

WSP. 2015b. Letter from Mr. James A. Sobieraj, P.E., to Mr. Robert D. DeCandia, Jr., P.E., Environmental Engineer II of the NYSDEC regarding Soil Vapor Intrusion (SVI) Mitigation Pilot Test Work Plan, Former General Instrument Corporation Site, Hicksville, New York. September 25.

WSP. 2016. Soil Vapor Intrusion Mitigation Plan, Former General Instrument Corporation Site, Hicksville, New York. February 19.

Figures



Reference

7.5 Minute Series Topographic Quadrangle
Hicksville, New York
Photorevised 1979 Scale 1:25,000 Metric

N

Quadrangle Location

Scale in Meters

0 500 1000

0 1000 2000

Scale in Feet

WSP | PARSONS BRINCKERHOFF

WSP | Parsons Brinckerhoff
75 Arlington Street, 4th Floor
Boston, MA 02116
617-426-7330

Figure 1
Site Location
Former General Instrument Corporation Site
Hicksville, New York

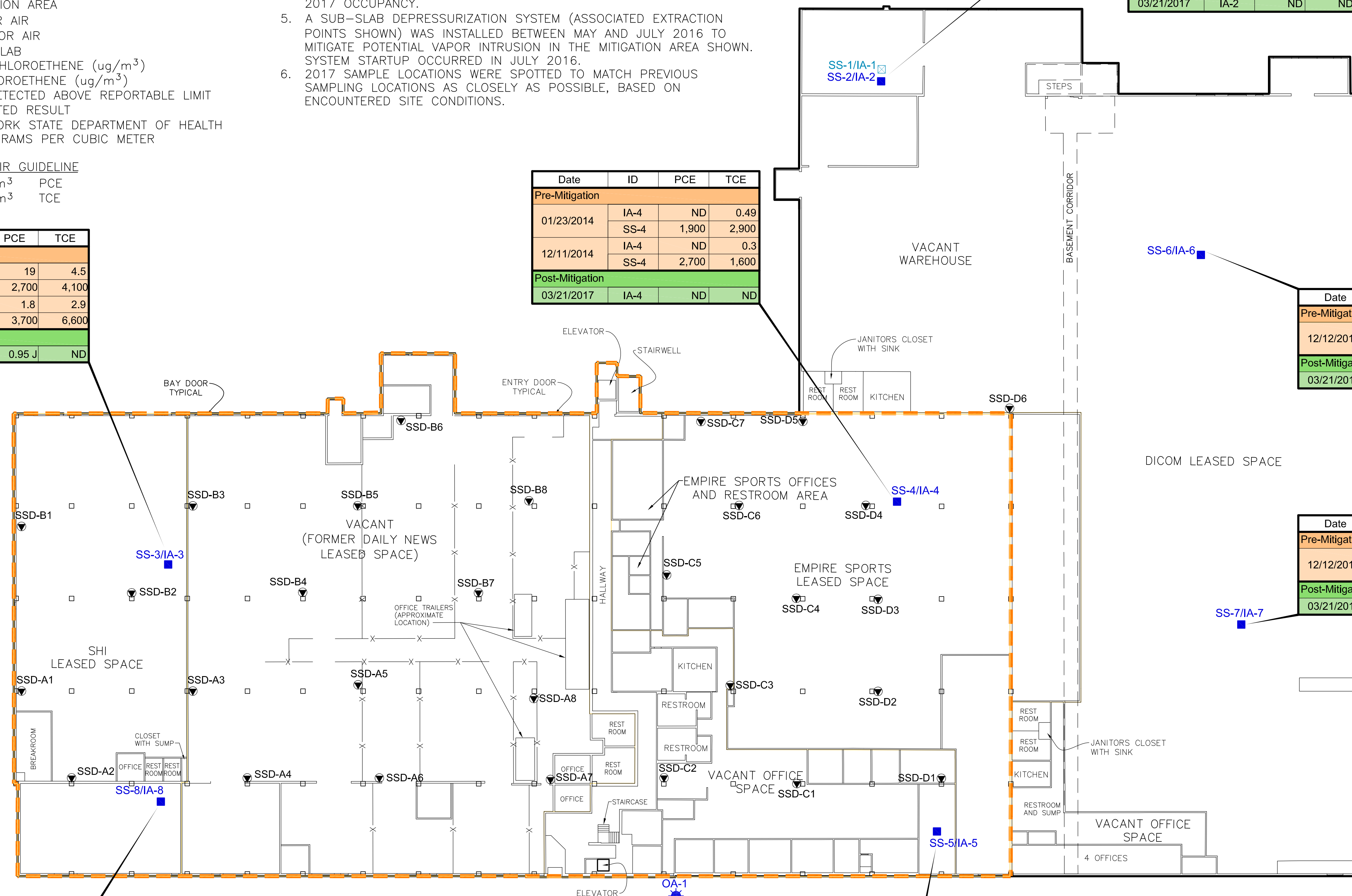
LEGEND

——x——	CHAIN LINK FENCE
□	BUILDING COLUMN
⊠	2012 SUB–SLAB/INDOOR AIR SAMPLE
■	SUB–SLAB/INDOOR AIR SAMPLE
✹	OUTDOOR AIR SAMPLE
▼	SUB–SLAB DEPRESSURIZATION EXTRACTION POINT
– – –	MITIGATION AREA
IA	INDOOR AIR
OA	OUTDOOR AIR
SS	SUB–SLAB
PCE	TETRACHLOROETHENE (ug/m^3)
TCE	TRICHLOROETHENE (ug/m^3)
ND	NOT DETECTED ABOVE REPORTABLE LIMIT
J	ESTIMATED RESULT
NYSDOH	NEW YORK STATE DEPARTMENT OF HEALTH
ug/m^3	MICROGRAMS PER CUBIC METER

NYSDOH AIR GUIDELINE

30 ug/m^3 PCE
2 ug/m^3 TCE

NOTES:
1. BUILDING CONSTRUCTION SURVEYS WERE CONDUCTED BY WSP ON AUGUST 21, 2015 AND SEPTEMBER 11, 2015.
2. SAMPLE LOCATIONS ARE APPROXIMATE AND HAVE NOT BEEN SURVEYED.
3. INTERIOR WALL AND CHAIN LINK FENCE LOCATIONS IN THE FORMER DAILY NEWS LEASED SPACE ARE APPROXIMATE AND HAVE NOT BEEN SURVEYED.
4. BUILDING LAYOUT, OCCUPANTS, AND LEASED SPACES BASED ON MARCH 2017 OCCUPANCY.
5. A SUB–SLAB DEPRESSURIZATION SYSTEM (ASSOCIATED EXTRACTION POINTS SHOWN) WAS INSTALLED BETWEEN MAY AND JULY 2016 TO MITIGATE POTENTIAL VAPOR INTRUSION IN THE MITIGATION AREA SHOWN. SYSTEM STARTUP OCCURRED IN JULY 2016.
6. 2017 SAMPLE LOCATIONS WERE SPOTTED TO MATCH PREVIOUS SAMPLING LOCATIONS AS CLOSELY AS POSSIBLE, BASED ON ENCOUNTERED SITE CONDITIONS.



Date	ID	PCE	TCE
Pre-Mitigation			
01/23/2014	IA-2	ND	ND
	SS-2	29	50
12/11/2014	IA-2	ND	ND
	SS-2	50	230
Post-Mitigation			
03/21/2017	IA-2	ND	ND

Date	ID	PCE	TCE
Pre-Mitigation			
01/23/2014	IA-4	ND	0.49
	SS-4	1,900	2,900
12/11/2014	IA-4	ND	0.3
	SS-4	2,700	1,600
Post-Mitigation			
03/21/2017	IA-4	ND	ND

Date	ID	PCE	TCE
Pre-Mitigation			
01/23/2014	IA-3	19	4.5
	SS-3	2,700	4,100
12/12/2014	IA-3	1.8	2.9
	SS-3	3,700	6,600
Post-Mitigation			
03/21/2017	IA-3	0.95 J	ND

Date	ID	PCE	TCE
Pre-Mitigation			
12/12/2014	IA-6	ND	0.27
	SS-6	54	140
Post-Mitigation			
03/21/2017	IA-6	ND	ND

Date	ID	PCE	TCE
Pre-Mitigation			
12/12/2014	IA-7	ND	0.27
	SS-7	15	20
Post-Mitigation			
03/21/2017	IA-7	ND	ND

Date	ID	PCE	TCE
Pre-Mitigation			
12/12/2014	IA-8	3.5	5.4
	SS-8	2,300	3,900
Post-Mitigation			
03/21/2017	IA-8	1.4	1.7

Date	ID	PCE	TCE
Post-Mitigation			
03/21/2017	OA-1	ND	0.86

Date	ID	PCE	TCE
Pre-Mitigation			
01/23/2014	IA-5	ND	0.49
	SS-5	47	76
12/12/2014	IA-5	ND	0.27
	SS-5	31 J	3.5
Post-Mitigation			
03/21/2017	IA-5	ND	ND

B REFERENCE:
WSP TRANSPORTATION & INFRASTRUCTURE DRAWING TITLED BUILDING CONSTRUCTION SURVEY, DATED SEPTEMBER 2, 2015, JOB NO. 188062, HICKSVILLE WAREHOUSE.DWG.

NOTICE: THIS DRAWING HAS BEEN PREPARED UNDER THE DIRECTION OF A PROFESSIONAL. DO NOT ALTER THIS DOCUMENT IN ANY WAY WITHOUT THE WRITTEN CONSENT OF WSP USA CORP.

0 50 100
SCALE IN FEET

N

Drawn By: EGC
Checked: SBK 5/9/2017
Approved:
DWG Name: 314V0648-001

FORMER GENERAL INSTRUMENT CORPORATION SITE
HICKSVILLE, NEW YORK
PREPARED FOR
ASKIN & HOOKER, LLC
SPARTA, NEW JERSEY

Figure 2
BUILDING LAYOUT AND INTERIOR SVI INVESTIGATION RESULTS FOR PCE AND TCE

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